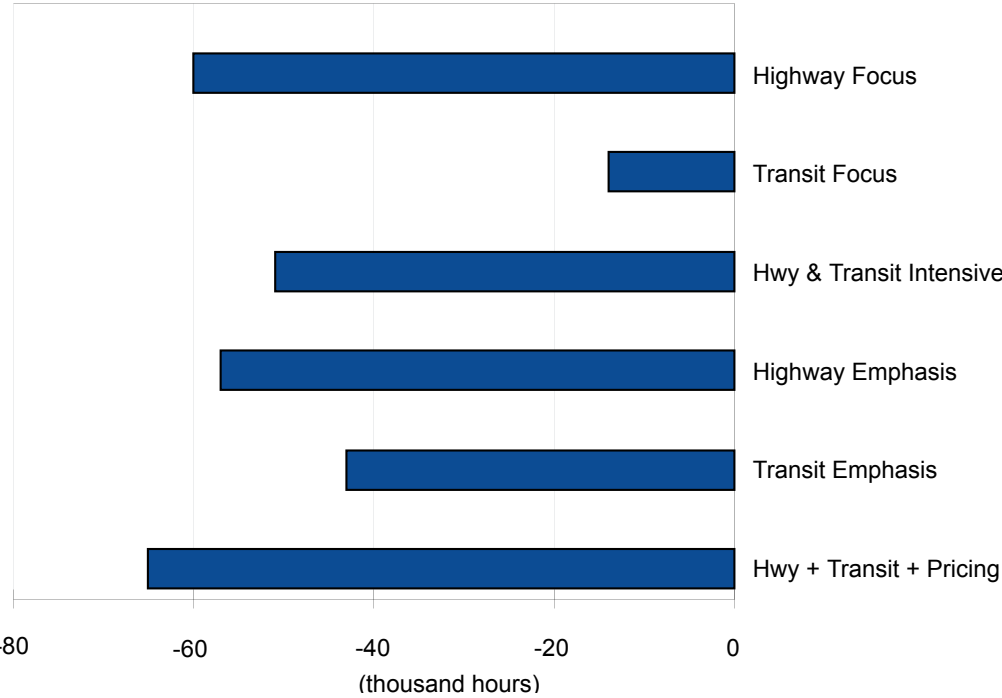
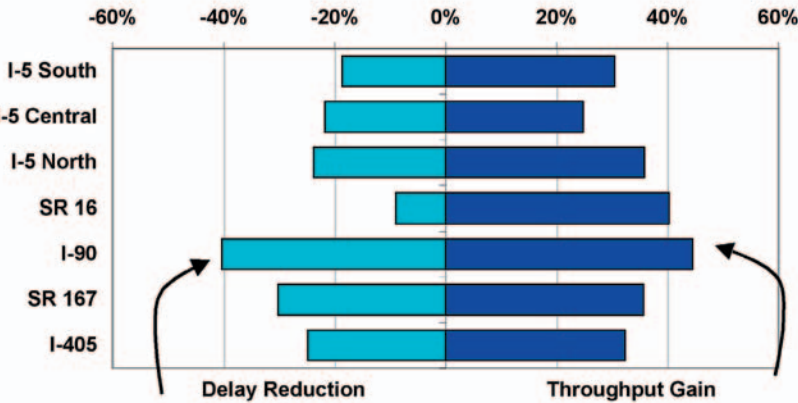


How Seven* Scenarios Compare When Their Forecasted Results are Measured Against Annual Person-Hours of Delay Reduction Per \$1 Million of Capital Improvement from the Baseline of Expected Annual Person-Hours of Delay in 2025



*Pricing Focus Scenario (not shown) indicates much higher delay reductions per million dollars of investment, however significant modeling and implementation challenges exist.

How a HOT Lane Network, in Addition to a Mixed Highway and Transit Improvement Scenario, Could Further Reduce Delay and Improve Throughput



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Urban Areas Congestion Analysis

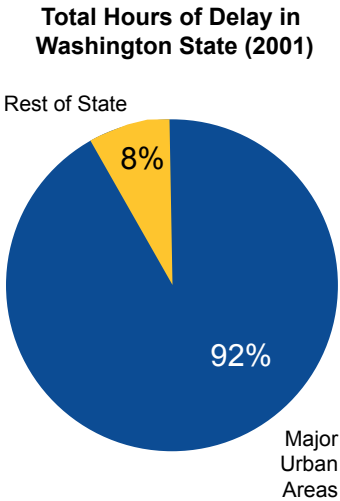
The urban and near-urban areas of Washington have grown rapidly in recent decades. Evidence—new houses and shopping areas—is everywhere. Jobs have grown, too. With the growth has come ever-expanding traffic on freeways and highways, where peak-period demand has outgrown the capacity of transportation systems. Two million more people are expected to be added to the state's population by 2025, and most of them are also expected to locate in the state's urban and near-urban areas. How can investments in transportation systems and facilities best offset the substantial further increases in congestion and delay that are expected to accompany this growth?

Why Study Congestion?

In 2003, the Washington State Legislature requested that the Washington State Department of Transportation (WSDOT) study congestion in the form of delay both now and in the future in our state's major urban areas. The study's purpose was to help understand, using the computer forecasting tools now used by regional planners, how various ways of approaching transportation investment might help to offset the coming increases in congestion and delay. Policy-makers and the public can include the results of the analysis in their thinking on how to address the ever-increasing and very costly problem of the imbalance between peak-period demand and peak-period capacity in our transportation systems, especially our freeways and highways serving the urbanized areas.

Three separate but coordinated studies were conducted for the Central Puget Sound, Vancouver and Spokane regions. For each region a travel-demand model was used to forecast future travel patterns in order to assess what congestion might look like in the year 2025. Projected travel demands were based on regionally adopted growth plans and forecasts of population and employment. A series of new transportation scenarios were then analyzed, using a computer model, to project how traffic congestion could be reduced. The new scenarios focused on utilizing highway investments, transit investments, pricing (tolling) or combinations of the three. Finally, an economic benefit/cost assessment was conducted of the scenarios.

- In broad terms, the analysis will help inform policy makers on:
- What is the existing performance of our transportation system?
 - How much will our urban areas grow in population and employment over the next 20 years based on current growth management plans?
 - What does this growth mean for future demands on our transportation system?
 - What are some of the investment options and how does a computer model suggest they would meet particular levels of congestion relief?
 - What are the costs and benefits of these options?



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What is the Level of Traffic Congestion Today?

From 1980 to 2003, Washington’s population grew by 45 percent, the number of vehicles increased by 33 percent, and the number of workers grew by 55 percent. Vehicle-miles traveled nearly doubled, up over 90 percent, while the number of lane-miles increased by only 8 percent. This growth was concentrated almost entirely in and near the state’s urban areas. As a result, congestion and resulting delays grew on many important highways, especially in the state’s most urbanized areas; Central Puget Sound, Vancouver, and Spokane.

The information presented below focuses on analysis conducted for the central Puget Sound region. Results for Spokane and Vancouver will be added later.

What Are the Future Population and Employment Projections for the Central Puget Sound Region?

The study area for Central Puget Sound includes Snohomish, King, Pierce, and Kitsap Counties.

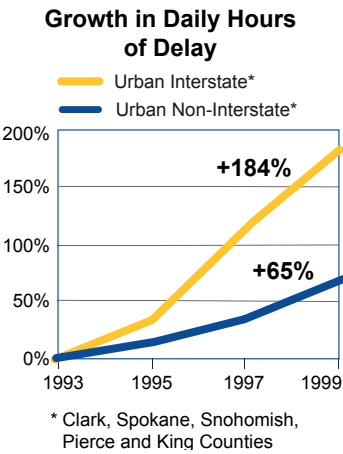
Forecasts indicate that population and employment in the Central Puget Sound region will continue to grow rapidly. The number of households, employment, and population are forecast to increase each decade by approximately 220,000, 300,000, and 460,000, respectively.

How Does Planning for Growth Lay the Groundwork for Planning for Transportation?

Cities and counties have prepared comprehensive plans under the state’s Growth Management Act. These plans are intended to help guide the growth of housing and jobs within designated growth areas. Generally, one of the foundations of the comprehensive plans is that growth will be shaped in ways that will make transportation more efficient. In turn, the transportation system will be developed in ways that will underscore and reinforce the patterns of growth described in the comprehensive plans.

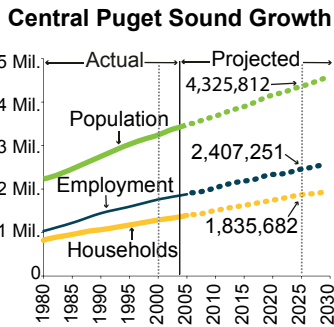
Based on these expectations for the Growth Management Act, the Puget Sound Regional Council (PSRC) has prepared forecasts of where people will live and work in the Central Puget Sound region, looking toward a planning horizon in the year 2030. Key elements of those forecasts include:

- Strong residential growth will occur outside of King County while the majority of the job growth will be in King County.
- Dramatic increase in travel demand, in Puget Sound:
 - Person trips will go up 48 percent, 12 million to 18 million per day.
 - Vehicle miles traveled will increase by 50 percent, from 73 to 110 million miles.
- Increase in the complexity of travel:
 - More suburb-to-suburb travel.
 - Travel to and from Snohomish County will increase 70 percent, East King County up by 53 percent.

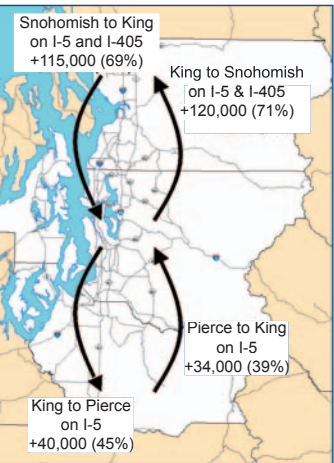


Puget Sound Travel Profile: Today vs. 2025

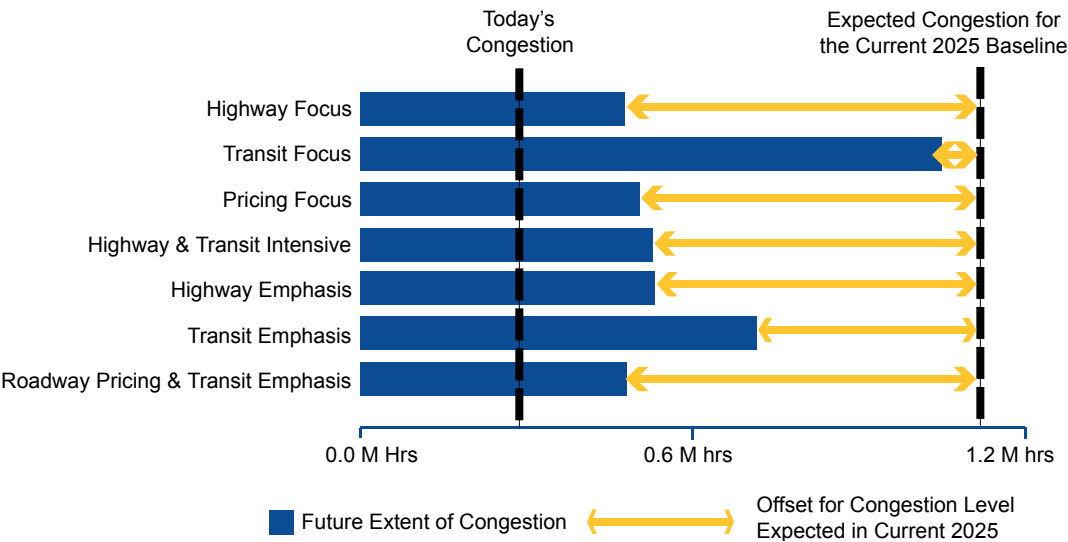
| | 2000 | 2025 |
|-------------|------|------|
| Drive Alone | 73% | 68% |
| Carpool | 20% | 18% |
| Transit | 7% | 13% |



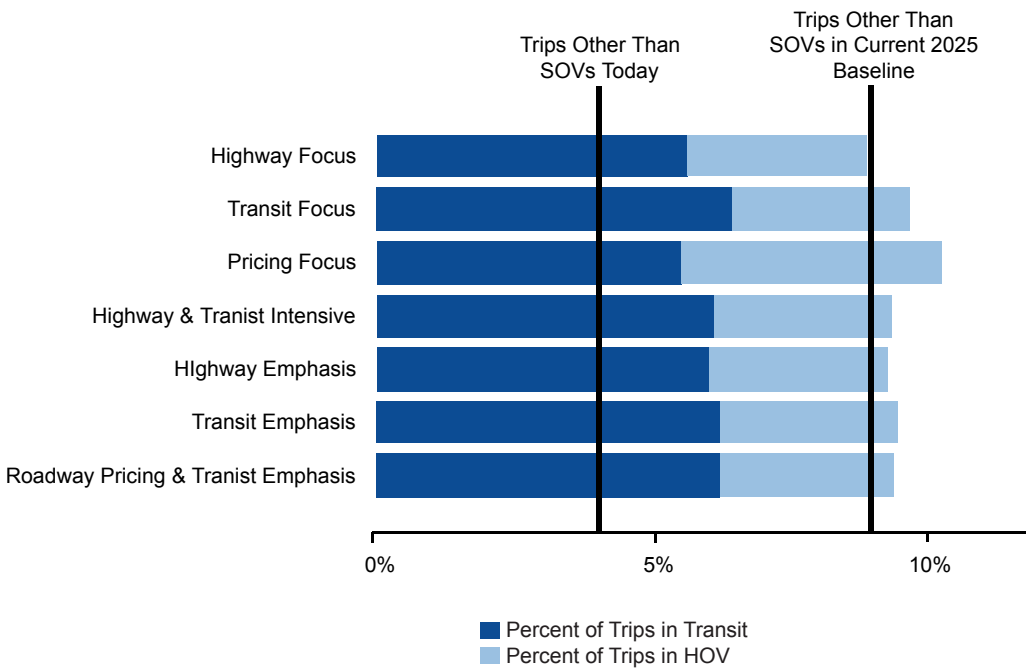
The 2025 forecasts of where people will live and work in the Central Puget Sound region were interpolated from and are consistent with the 2030 forecasts prepared by the Puget Sound Regional Council.



How Seven Scenarios Compare When Their Forecasted Results are Measured Against Today’s Congestion and the Baseline of Expected Congestion in 2025?



How Seven Scenarios Compare When Their Forecasted Results are Measured Against Today’s Percentage of Non-SOV Use and the Baseline of Expected Non-SOV Use in 2025





Can We Help Offset Increases in Congestion by Placing HOT Lanes on the Freeways?

In addition to the seven scenarios, analysis was conducted to consider the effects of creating a High Occupancy Toll (HOT) lane system in the Central Puget Sound region. HOT lanes use price and occupancy restrictions to manage the number of vehicles traveling on them, so that vehicle volumes are always kept at the highest level that does not cause traffic to slow down, creating congestion and resulting in delays.

HOT lanes provide travelers with a choice of paying a toll to use relatively uncongested travel lanes, or incurring the time costs of congestion in the toll-free lanes.

A HOT lane network for this analysis was defined as two lanes in each direction, on a freeway comprising an existing HOV lane and several adjacent general freeway lanes.

A key element of the analysis is targeted HOT lanes that not only reduce overall corridor delay, but also make the system more efficient.

What Does the Urban-Areas Congestion Analysis Tell Us?

Some areas of the state, especially the three largest urban areas, will continue to grow. In turn, without new transportation improvements, traffic congestion will get much worse than experienced today. In the meantime, the cost of building transportation capacity will continue to escalate. Consequently, large-scale system-wide congestion relief through major expansion of highway and transit capacity alone is extremely expensive and very difficult to implement. However, to maintain Washington’s quality of life and economic vitality, some means must be found to help meet the growing demand.

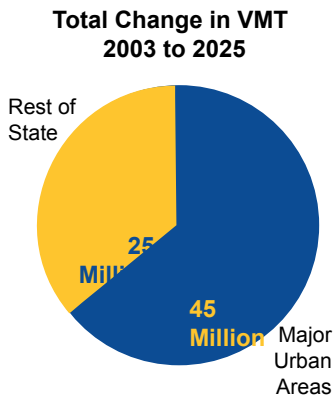
The analysis shows that effective strategies for fighting the growing demand and capacity imbalance are based on the strategically located combination of transportation supply and demand management. This is demonstrated when the computer model added pricing to a mix of highway and transit capacity improvements. The effect is a large increase in benefits for a small additional cost.

The strategic combination of highway and transit improvements with pricing appears to strike an attractive balance between adding capacity and managing demand to achieve the greatest return possible on transportation investments. This will be further investigated in Phase 2 of the study.

How Will Increased Travel be Accommodated in the Central Puget Sound Region Over the Next 25 Years?

The Puget Sound Regional Council (PSRC) model takes the forecasts of increased population and jobs for the Central Puget Sound region and translates them into forecasts of more trips and revised patterns of travel. Today’s gap between transportation demand and transportation capacity will grow even more acute. The model predicts that without new transportation investment, there will be huge increases in total daily delay—a 300 percent increase from 285,000 hours of delay today to 1,118,000 hours of delay by 2025. Other key elements of the forecasts from the computer model include:

- The existing road system will have 40 percent more vehicles attempting to travel on it.
- Traffic flow in all corridors is forecast to deteriorate substantially, with about an average of nine hours of congested traffic conditions each day in heavily travelled corridors.
- Travel times will become more variable and less predictable.
- Truck delays will increase by over 100,000 hours per day in 2025—a 300 percent increase.



How Can We Fight Back Against the Increases in Delays and Congestion?

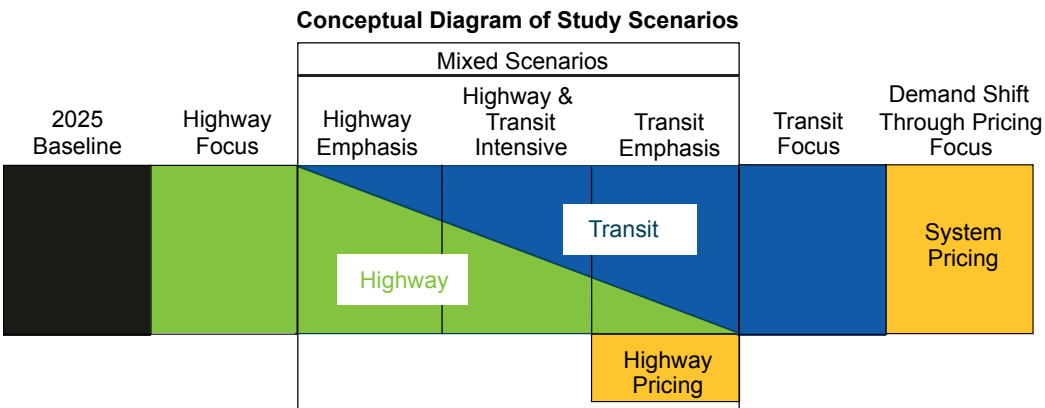
The challenge for the Central Puget Sound region is to devise remedies for the growing pressure—and the accompanying rise in congestion and delay—that growth places on urban transportation facilities, especially major highways and freeways whose capacity, at least during peak periods, has already been reached and surpassed.

There are essentially three choices:

- Undertake major investment in new roads and/or transit systems to expand capacity to see how the computer model would predict future congestion levels.
- Place pricing on the use of highway systems to alter travel demand and spread the use of the system away from congested periods and into uncongested periods.
- Combine these strategies with supporting programs such as Transportation Demand Management.

The Study Allows Us to See How the Computer Model Would Predict Future Congestion Levels

Seven different investment scenarios were analyzed. They include a current baseline for 2025 containing projects that are today committed to and funded; three scenarios that would focus new investment exclusively on roadways, transit, or pricing; and three mixed scenarios



How the Travel Forecast Model Works

Planners use computerized travel demand forecast models to predict future travel conditions and congestion levels. The travel patterns are based on what levels of growth will occur and where jobs and housing will locate. The model uses a series of steps to get forecast results:

1. Trip generation forecasts the number of trips that will be made;
2. Trip distribution determines where the trips will go;
3. Mode choice predicts how the trips will be served by the available modes of travel; and
4. Trip assignment predicts the routes that the trips will take, resulting in traffic forecasts for the highway system and ridership forecasts for the transit system.



What Types of Highway Expansion Were Studied?

For example, to meet the highway demand on I-5 through downtown Seattle, a 10-mile, six-lane tunnel was used in models. (A tunnel was used because severe right-of-way limitations and high property costs ruled out a surface solution.) The cost of this tunnel could be \$150-200 million per lane-mile, or up to \$10 billion total, in today's dollars. Without such a tunnel, congestion on I-5 in 2025 would last about ten hours a day. With such a tunnel, congestion in 2025 would last about seven hours a day, roughly as it does now.

that included investments in more than one type of capacity improvement. An analytical computer model was then used to test how each of these scenarios would perform against future congestion levels using a number of measurements.

Can We Reduce Congestion With Major Highway Improvements?

Highway expansion was analyzed by testing varying levels of freeway and arterial expansion to see how the computer model would predict they would affect future congestion levels. In the Central Puget Sound region, the most expansive highway scenario added about 1,230 more freeway and 730 more arterial lane miles to the current baseline for 2025. This would represent a 17 percent growth in arterial lane miles, and a 50 percent growth in freeway lane miles over the lane miles now expected to be in place in 2025 with today's committed and funded projects. Overall, the increment to the 2025-expected total of arterial and freeway lane miles would be about 16 percent.

Key elements of the forecasts from the computer model include:

- Roadway improvements can effectively reduce congestion, and travel times for several commute trips could be greatly improved; some would be better than today.
- However, future growth will overmatch the ability of these improvements to reduce total delay below today's conditions.
- Physical, economic and political constraints within many urban centers would also make major roadway expansion very expensive.

Can We Help Offset Increases in Congestion With Significant Transit Improvements?

The PSRC computer forecasting model was used to test the effects on future levels of congestion from a very aggressive expansion of transit infrastructure and services. In the Puget Sound area, bus service was quadrupled compared with existing conditions and over 200 miles of high-capacity transit facilities were added, including regional light rail and an extended monorail system in Seattle above levels currently funded.

Key elements of the forecasts from the computer model include:

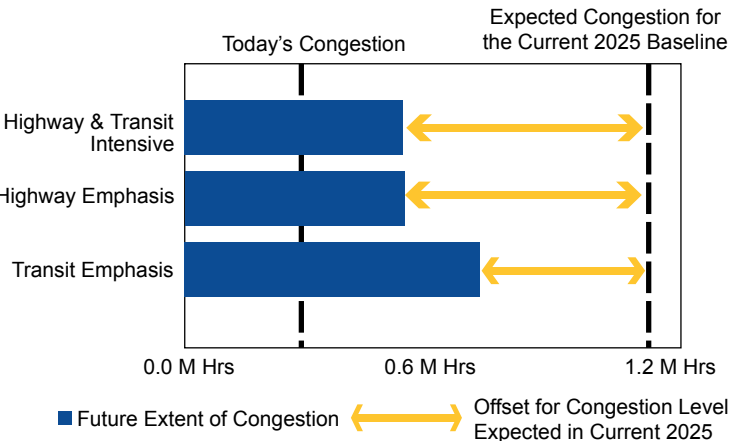
- Major transit investments provide travelers with viable options to congested driving conditions; but
- Transit investments will have little impact on traffic congestion across the region as a whole.
- Transit is most effective when serving congested corridors with high density land uses and large employment centers during peak commuting periods.

Can We Help Offset Increases in Congestion With Mixes of Highway and Transit Investments?

The PSRC computer forecasting model was also used to test the effects on future levels of congestion from three scenarios that blended highway and transit investments. One scenario combined high levels of both highway and transit investment. A second scenario matched a high level of highway with a lower level of transit investment, while the third scenario matched a high transit with a relatively lower highway investment strategy.

Key elements of the forecasts from the computer model include:

- Combining roadway and transit improvements to match the unique characteristics of particular corridors provides the potential for more practical congestion-relief when compared to single strategies.
- Transit investments are most effective in the urban core where capacity investment costs are high and congestion is persistent for much of the day.



Can We Help Offset Increases in Congestion With a Strategy of Placing Prices on Highway Use That Vary Up and Down by Time of Day Depending on Levels of Congestion?

The PSRC computer forecasting model was used to test a pricing scenario in which all freeways, highways and arterials in the central Puget Sound region would be subject to variable tolling. The toll would be zero when traffic demand was low and roads are uncongested, with the toll rising as demand builds to help prevent demand from exceeding capacity. At high-demand times, increasingly higher tolls would motivate people to alter their travel behavior by traveling by transit or carpool, or by changing the time of their trip. By changing behavior of a relatively small percentage of travelers, tolls would help align demand with capacity to allow everyone to get the most out of the transportation system.

Key elements of the forecasts from the computer model include:

- Pricing strategies are very effective in reducing delay if they use tolls that vary according to the level of congestion.
- Combining pricing with new capacity investments proved to be particularly effective at reducing congestion delays and serving more people.
- Pricing roadways can help to maximize the efficiency of our transportation system, and may also produce revenues that can be put to productive uses.